



$I(J^P) = 0(\frac{1}{2}^+)$ Status: ***

In the quark model, a Λ_b^0 is an isospin-0 $ud\bar{b}$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I , J , or P have actually been measured.

Λ_b^0 MASS

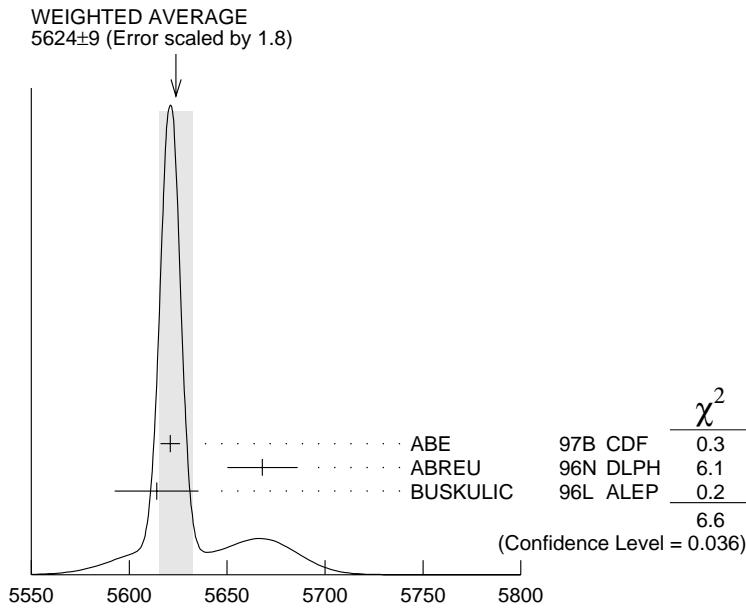
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
5624 ± 9 OUR AVERAGE	Error includes scale factor of 1.8. See the ideogram below.			
5621 ± 4 ± 3	1	ABE	97B CDF	$p\bar{p}$ at 1.8 TeV
5668 ± 16 ± 8	4	2 ABREU	96N DLPH	$e^+e^- \rightarrow Z$
5614 ± 21 ± 4	4	2 BUSKULIC	96L ALEP	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	3	ABE	93B CDF	Sup. by ABE 97B
5640 ± 50 ± 30	16	4 ALBAJAR	91E UA1	$p\bar{p}$ 630 GeV
5640 $^{+100}_{-210}$	52	BARI	91 SFM	$\Lambda_b^0 \rightarrow p D^0 \pi^-$
5650 $^{+150}_{-200}$	90	BARI	91 SFM	$\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^+ \pi^- \pi^-$

¹ ABE 97B observed 38 events above a background 18 ± 1.6 events in the mass range $5.60\text{--}5.65 \text{ GeV}/c^2$, a significance of > 3.4 standard deviations.

² Uses 4 fully reconstructed Λ_b events.

³ ABE 93B states that, based on the signal claimed by ALBAJAR 91E, CDF should have found $30 \pm 23 \Lambda_b^0 \rightarrow J/\psi(1S)\Lambda$ events. Instead, CDF found not more than 2 events.

⁴ ALBAJAR 91E claims 16 ± 5 events above a background of 9 ± 1 events, a significance of about 5 standard deviations.



Λ_b^0 mass (MeV)

Λ_b^0 MEAN LIFE

These are actually measurements of the average lifetime of weakly decaying b baryons weighted by generally unknown production rates, branching fractions, and detection efficiencies. Presumably, the mix is mainly Λ_b^0 , with some Ξ_b^0 and Ξ_b^- .

See b -baryon Admixture section for data on b -baryon mean life average over species of b -baryon particles.

"OUR EVALUATION" is an average of the data listed below performed by the LEP B Lifetimes Working Group as described in our review "Production and Decay of b -flavored Hadrons" in the B^\pm Section of the Listings. The averaging procedure takes into account correlations between the measurements and asymmetric lifetime errors.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID	TECN	COMMENT
1.229±0.080 OUR NEW EVALUATION		$[(1.24 \pm 0.08) \times 10^{-12}$ s OUR 1998 EVALUATION]		
Average is meaningless.		$[(1.24 \pm 0.08) \times 10^{-12}$ s OUR 1998 AVERAGE]		
1.11 $^{+0.19}_{-0.18}$ ± 0.05	5 ABREU	99W DLPH	$e^+ e^- \rightarrow Z$	
1.29 $^{+0.24}_{-0.22}$ ± 0.06	5 ACKERSTAFF	98G OPAL	$e^+ e^- \rightarrow Z$	
1.21 ± 0.11	5 BARATE	98D ALEP	$e^+ e^- \rightarrow Z$	
1.32 ± 0.15 ± 0.07	ABE	96M CDF	Excess $\Lambda_c \ell^-$, decay lengths	

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.19	$\begin{array}{c} +0.21 \\ -0.18 \end{array}$	$\begin{array}{c} +0.07 \\ -0.08 \end{array}$	ABREU	96D DLPH	Repl. by ABREU 99W
1.14	$\begin{array}{c} +0.22 \\ -0.19 \end{array}$	± 0.07	69	AKERS	95K OPAL Repl. by ACKER-STAFF 98G
1.02	$\begin{array}{c} +0.23 \\ -0.18 \end{array}$	± 0.06	44	BUSKULIC	95L ALEP Repl. by BARATE 98D

⁵ Measured using $\Lambda_c \ell^-$ and $\Lambda \ell^+ \ell^-$.

Λ_b^0 DECAY MODES

These branching fractions are actually an average over weakly decaying b -baryons weighted by their production rates in Z decay (or high-energy $p\bar{p}$), branching ratios, and detection efficiencies. They scale with the LEP b -baryon production fraction $B(b \rightarrow b\text{-baryon})$ and are evaluated for our value $B(b \rightarrow b\text{-baryon}) = (11.6 \pm 2.0)\%$.

The branching fractions $B(b\text{-baryon} \rightarrow \Lambda \ell^- \bar{\nu}_\ell \text{anything})$ and $B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything})$ are not pure measurements because the underlying measured products of these with $B(b \rightarrow b\text{-baryon})$ were used to determine $B(b \rightarrow b\text{-baryon})$, as described in the note "Production and Decay of b -Flavored Hadrons."

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $J/\psi(1S)\Lambda$	$(4.7 \pm 2.8) \times 10^{-4}$	
Γ_2 $p D^0 \pi^-$		
Γ_3 $\Lambda_c^+ \pi^-$	seen	
Γ_4 $\Lambda_c^+ a_1(1260)^-$	seen	
Γ_5 $\Lambda_c^+ \pi^+ \pi^- \pi^-$		
Γ_6 $\Lambda K^0 2\pi^+ 2\pi^-$		
Γ_7 $\Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything}$	[a] $(7.9 \pm 1.9) \%$	
Γ_8 $p \pi^-$	$< 5.0 \times 10^{-5}$	90%
Γ_9 $p K^-$	$< 5.0 \times 10^{-5}$	90%

[a] Not a pure measurement. See note at head of Λ_b^0 Decay Modes.

Λ_b^0 BRANCHING RATIOS

$\Gamma(J/\psi(1S)\Lambda)/\Gamma_{\text{total}}$

Γ_1/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$4.7 \pm 2.1 \pm 1.9$	6	ABE	97B CDF	$p\bar{p}$ at 1.8 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

155.2 \pm 94.8 \pm 26.8 16 ⁷ ALBAJAR 91E UA1 $J/\psi(1S) \rightarrow \mu^+ \mu^-$

⁶ ABE 97B reports $(0.037 \pm 0.017(\text{stat}) \pm 0.007(\text{sys}))\%$ for $B(b \rightarrow b\text{-baryon}) = 0.1$ and for $B(B^0 \rightarrow J/\psi(1S) K_S^0) = 0.037\%$. We rescale to our PDG 98 best value $B(b \rightarrow b\text{-baryon}) = (10.1^{+3.9}_{-3.1})\%$ and $B(B^0 \rightarrow J/\psi(1S) K_S^0) = (0.044 \pm 0.006)\%$. Our first

error is their experiments's error and our second error is the systematic error from using our best value.

⁷ ALBAJAR 91E reports 180 ± 110 for $B(\bar{b} \rightarrow b\text{-baryon}) = 0.10$. We rescale to our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(pD^0\pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
seen	52	BARI	91	SFM	$D^0 \rightarrow K^-\pi^+$
seen		BASILE	81	SFM	$D^0 \rightarrow K^-\pi^+$

$\Gamma(\Lambda_c^+\pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
seen	3	ABREU	96N	DLPH	$\Lambda_c^+ \rightarrow pK^-\pi^+$
seen	4	BUSKULIC	96L	Alep	$\Lambda_c^+ \rightarrow pK^-\pi^+, p\bar{K}^0, \Lambda\pi^+\pi^+\pi^-$

$\Gamma(\Lambda_c^+ a_1(1260)^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
seen	1	ABREU	96N	DLPH	$\Lambda_c^+ \rightarrow pK^-\pi^+, a_1^- \rightarrow \rho^0\pi^- \rightarrow \pi^+\pi^-\pi^-$

$\Gamma(\Lambda_c^+\pi^+\pi^-\pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
seen	90	BARI	91	SFM	$\Lambda_c^+ \rightarrow pK^-\pi^+$

$\Gamma(\Lambda K^0 2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
seen	4	⁸ ARENTON	86	FMPS	$\Lambda K_S^0 2\pi^+ 2\pi^-$

⁸ See the footnote to the ARENTON 86 mass value.

$\Gamma(\Lambda_c^+\ell^-\bar{\nu}_\ell \text{anything})/\Gamma_{\text{total}}$

The values and averages in this section serve only to show what values result if one assumes our $B(b \rightarrow b\text{-baryon})$. They cannot be thought of as measurements since the underlying product branching fractions were also used to determine $B(b \rightarrow b\text{-baryon})$ as described in the note on "Production and Decay of b -Flavored Hadrons."

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
0.079 ± 0.019 OUR NEW AVERAGE		[0.090 ^{+0.031} _{-0.038} OUR 1998 AVERAGE]			
0.074 ± 0.013 ± 0.013		⁹ BARATE	98D	Alep $e^+e^- \rightarrow Z$	
0.102 ^{+0.035} _{-0.029} ± 0.018	29	¹⁰ ABREU	95S	DLPH $e^+e^- \rightarrow Z$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
0.065 ± 0.016 ± 0.011	55	¹¹ BUSKULIC	95L	Alep Repl. by BARATE 98D	
0.13 ± 0.05 ± 0.02	21	¹² BUSKULIC	92E	Alep $\Lambda_c^+ \rightarrow pK^-\pi^+$	

- ⁹ BARATE 98D reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.0086 \pm 0.0007 \pm 0.0014$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Measured using $\Lambda_c^+ \ell^-$ and $\Lambda \ell^+ \ell^-$.
- ¹⁰ ABREU 95S reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.0118 \pm 0.0026^{+0.0031}_{-0.0021}$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ¹¹ BUSKULIC 95L reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.00755 \pm 0.0014 \pm 0.0012$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ¹² BUSKULIC 92E reports $[B(\Lambda_b^0 \rightarrow \Lambda_c^+ \ell^- \bar{\nu}_\ell \text{anything}) \times B(\bar{b} \rightarrow b\text{-baryon})] = 0.015 \pm 0.0035 \pm 0.0045$. We divide by our best value $B(\bar{b} \rightarrow b\text{-baryon}) = (11.6 \pm 2.0) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Superseded by BUSKULIC 95L.

 $\Gamma(p\pi^-)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_8/Γ
$<5.0 \times 10^{-5}$	90	13 BUSKULIC	96V ALEP	$e^+ e^- \rightarrow Z$	

13 BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

 $\Gamma(pK^-)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_9/Γ
$<5.0 \times 10^{-5}$	90	14 BUSKULIC	96V ALEP	$e^+ e^- \rightarrow Z$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$<3.6 \times 10^{-4}$ 90 15 ADAM 96D DLPH $e^+ e^- \rightarrow Z$

14 BUSKULIC 96V assumes PDG 96 production fractions for B^0 , B^+ , B_s , b baryons.

15 ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$.

 Λ_b^0 REFERENCES

ABREU	99W	EPJ C10 185	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF	98G	PL B426 161	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
BARATE	98D	EPJ C2 197	R. Barate <i>et al.</i>	(ALEPH Collab.)
PDG	98	EPJ C3 1	C. Caso <i>et al.</i>	
ABE	97B	PR D55 1142	F. Abe <i>et al.</i>	(CDF Collab.)
ABE	96M	PRL 77 1439	F. Abe <i>et al.</i>	(CDF Collab.)
ABREU	96D	ZPHY C71 199	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ABREU	96N	PL B374 351	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ADAM	96D	ZPHY C72 207	W. Adam <i>et al.</i>	(DELPHI Collab.)
BUSKULIC	96L	PL B380 442	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
BUSKULIC	96V	PL B384 471	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
PDG	96	PR D54 1		
ABREU	95S	ZPHY C68 375	P. Abreu <i>et al.</i>	(DELPHI Collab.)
AKERS	95K	PL B353 402	R. Akers <i>et al.</i>	(OPAL Collab.)
BUSKULIC	95L	PL B357 685	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ABE	93B	PR D47 R2639	F. Abe <i>et al.</i>	(CDF Collab.)
BUSKULIC	92E	PL B294 145	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ALBAJAR	91E	PL B273 540	C. Albajar <i>et al.</i>	(UA1 Collab.)
BARI	91	NC 104A 1787	G. Bari <i>et al.</i>	(CERN R422 Collab.)
ARENTON	86	NP B274 707	M.W. Arenton <i>et al.</i>	(ARIZ, NDAM, VAND)
BASILE	81	LNC 31 97	M. Basile <i>et al.</i>	(CERN R415 Collab.)